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Glossary of Mining Terms

Strata Reinforcement

GLOSSARY OF MINING TERMS

A brief explanation of strata reinforcement and associated geotechnical terms used in the Australian underground coal and metalliferous mining and civil tunnelling industries.

Term	Synonym	Explanation
A		
Abutment	–	– The areas of unmined rock at the edges of a stoping block that may carry large regional loads – Generally a zone of support for ground arching
Anticline	–	– An arch or fold in the layers of rock shaped like the crest of a wave, as opposed to a syncline which is similar to the trough of the wave
Arch	Rib support, arches	– A steel support of two or more sections which when bolted together, form a strong permanent support
Arching	Pressure arch	1. Fracture process around a mine opening, leading to stabilisation by an arching effect 2. The transfer of rock stress or load from an active mining area, eg. stope back, to a more stable area or abutment; this may result in the release of rock blocks
Auger	Drill rod	– A rotary drill rod for soft materials that uses an external screw to assist in removal of cuttings along the drill rod and exit the drilled hole
B		
Backfill	–	– Waste material used to support the walls of a stope and provide a working platform after removal of ore
Balk/baulk	Bar, cross-bar, crown, half-round crown, half-round	– Squared, round or half-round cross-sectioned wooden roof support which is set in contact with the roof and held in position by props, roof bolts, or both
Bar down	–	– To lever loose material from the roof, or rock, to make it safe
Beam	Girder	– A bar or straight girder (normally steel) used to support a span of roof between two support props or walls
Beam building	–	– The creation of a strong, inflexible beam by bolting or otherwise fastening together several weaker layers – In coal mining this is an intended basis for roof bolting
Bearing plate	Plate, face plate, plate washer	– A plate used to distribute a given load – In roof bolting, the plate used between the bolt head and the roof
Bed	–	– Stratum of coal or other sedimentary deposit
Bedding plane slip	–	– The relative movement or slip of continuous bedding planes or foliation planes in response to large areas of stope wall moving into a void, filled or unfilled – May be observed in areas where extensive stoping has been carried out in a well-bedded rock mass
Bedding planes	–	– Parallel bed or planes of weakness in the rock formed when there was a change in the deposition of minerals under water
Bit	–	– The hardened and strengthened device at the end of a drill rod that transmits the energy of breakage to the rock – The size of the bit determines the size of the hole – A bit may be either detachable from or integral with its supporting drill rod
Block caving	–	– A low cost method of mining in which large blocks of ore are undercut, causing the ore left in place to break and cave under its own weight
Bolt torque	–	– The turning force in Newton metres [Nm] or foot pounds [ft. lbs.] applied to a roof bolt to achieve an installed tension
Bord	–	– An underground passageway made in solid coal

Term	Synonym	Explanation
Butterflies	–	– Formed steel plate used to support the roof around some roof bolts – Often used in conjunction with steel mesh
C		
Cable bolts	Cables, birdcage bolts, minicage bolts	– One or more steel reinforcing strands placed in a hole drilled in rock, with cement or resin grout pumped into the hole usually over the full length of the cable – A steel faceplate is often attached to the cable by a barrel and wedge anchor – The cable(s) may be tensioned or un-tensioned – The steel rope strand may be either plain or de-bonded, such as birdcage or minicage, to improve the load transfer between the grout and the cable bolt
Cap	Cap block, lid, packing piece	– A piece of timber placed horizontally on top of one or two vertical timbers to increase bearing area for support of the roof
Centre leg	–	– Prop under centre of baulk or girder
Chemical cartridge	Resin anchor, chemical anchor	– Sausage shaped flexible container having two chemicals which, when mixed, form a quick setting resin – used to provide the anchorage in rock bolting
Chock	–	1. A roof support unit for use in large openings, which consists of wooden or steel blocks stacked between the floor and the roof and often filled with stone for added stability 2. A hydraulic support used with the longwall system of mining
Collar	–	1. The term applied to the timbering or concrete around the mouth or top of a shaft 2. The mouth of a drilled hole
Compressive stress	–	– A stress or pressure that tends to push or clamp objects together – The state of stress found in the rock mass before mining occurs which tends to hold the rock mass together
Conglomerate	–	– A sedimentary rock consisting of rounded, water-worn pebbles cemented together into a solid mass
Core	–	– The innermost portion; in this case, the cylindrical rock sample produced by the cutting action of a diamond drill
Country rock	–	– A loose term used to describe the general mass of rock adjacent to an ore body, as distinguished from the vein or ore deposit itself
Cover	–	– The overburden on any deposit
Creep	Floor heave	1. Upward movement of a relatively soft floor of a seam under pressure from adjacent coal pillars 2. Sometimes used for widespread movement of the upper strata because pillars left for roof support were of insufficient size
Cross-measure drift	–	– Tunnel cutting across the bedding of the strata
Cross-sticks	–	– Danger – do not pass this point
Crush	–	– When coal is broken because of the downward movement of the hard roof or the upward movement of the floor, or both
Cutter	–	– This is a joint line usually straight, which appears in the roof – It weakens the roof and must be considered when placing roof support
Cycle	–	– A method of working in which mining operations take place in a specified sequence

Term	Synonym	Explanation
		D
De-stressed zone	–	– A zone of rock around the perimeter of an excavation where the rock stress field has exceeded the strength of the rock mass at some time during its mining history – The rock mass is in a post-peak loading condition and it may be capable of carrying significant loads with low levels of lateral confinement being provided by reinforcement
Diamond drill	–	– A rotary type of rock drill in which the cutting is done by abrasion rather than percussion
Dip	–	1. The angle a plane makes with the horizontal 2. The grade of the coal seam. It is usually expressed as 1 in "x" in a given direction
Discontinuity	–	– Any significant mechanical break or fracture of negligible tensile strength in a rock
Displacement	–	1. A joint plane along which vertical or horizontal movement has occurred 2. The amount by which a seam is moved by a fault
Dolly	Mixing dolly, spanner, tightening dolly	– The tool used in the chuck of the bolting machine to rotate the roof bolt to mix the chemical anchors or to tighten the roof bolt nut or, to install friction bolts
Dowel	–	– An un-tensioned rock bolt which is usually fully encapsulated – They are often fitted with a plate in contact with the rock face
Downcast	–	– Shaft or other mine opening down which fresh air from the surface passes
Dragonfly	–	– A formed steel plate consisting of a "butterfly" and an attached steel plate and used in conjunction with rock bolts to secure ground in the roof/backs or sidewalls
Drift	–	– An inclined access from the surface to the coal seam or from one coal seam to another – It can often contain a conveyor belt or man-riding train
Drifter	–	– A machine mounted boring machine used to bore holes when driving drifts or drives – Normally they are of a rotary/percussive type – Often fitted to face "jumbo's"
Drill bits	Carbide bit	– The drill tool which usually screws into the top of the drill steel and used in the rock in the roof bolt hole drilling operation – The cutting tips on the drill bit are tungsten carbide, which are brazed onto the steel body
Drill steel	Steels	– The length of drill rod which fits into the chuck of the bolting machine to drill holes in the roof for the placement of rock bolts or in drilling holes when driving drifts, sinking shafts or other rock work
Dyke	–	1. Normally vertical intrusion of igneous rock cutting across the strata. Can vary tremendously between 0.6 [m] to 20 [m] or more in the horizontal dimension. 2. An intrusive body, which has disrupted the coal seam, by cutting vertically through it. Usually it has a cintered band of coal each side of the rock
		E
Egress	–	– A negotiable roadway (see "second means of egress").
Elastic	–	– Capable of sustaining stress without permanent deformation – Tending to return to its original shape or state when the applied stress is removed

Term	Synonym	Explanation
		F
Face	–	– The in-bye end of the mine roadway, usually the working place for coal, or ore, extraction
Falcon	Stoper, “panther”, air leg	– Generic name for a hand held rotary/percussive pneumatic machine used to drill vertically up or steeply inclined holes and to set rock bolts – The air leg is integral with the drill
Fall	–	– Collapse of roof material
Fault	Down through	1. Break in the continuity of a coal seam or rock strata. There are many types of fault 2. A naturally occurring plane or zone of weakness in the rock along which there has been movement. The amount of movement can vary widely
Fissure	–	– An extensive crack, break or fracture in the rocks.
Floater	Greasy back	1. A relatively insecure piece of roof material 2. A piece of waste rock in a seam or discontinuity in the roof
Foliation	–	– Alignment of minerals into parallel layers; can be planes of weakness in rocks
Footwall	–	– The rock on the underside of a vein or ore body
Friction bolts	“Friction rock stabilisers”	– Steel reinforcing elements, typically a “C” shaped shell, which are forced into holes drilled in the rock – Frictional forces between the side of the hole and the element to generate forces to limit rock movement – The anchorage capacity of the device depends on the anchorage length above any plane of weakness and the frictional interference between the borehole wall and the outer surface of the shell – Anchorage capacity is dependent on the hole diameter and the effective anchorage length in solid ground
		G
Geological structure	–	– A general term that describes the arrangement of rock formations – Also refers to the folds, joints, faults, foliation, schistosity, bedding planes and other planes of weakness in rock
Geology	–	– The scientific study of the earth, the rock of which it is composed and the changes which it has undergone or is undergoing
Geotechnical engineering	–	– The application of engineering geology, hydrogeology, soil mechanics, rock mechanics and mining seismology to the practical solution of ground control challenges
Goaf	Gob	– The area abandoned and left to collapse after the extraction of coal
Ground control	–	– The ability to predict and influence the behaviour of rock in a mining environment, having due regard for the safety of the work force and the required serviceability and design life of the openings
		H
Hanging wall	–	– The wall or rock on the upper side, or top, of a vein or ore deposit
		I
Induced stress	–	– The stress that is due to the presence of an excavation – The induced stress depends on the level of the in-situ stress and the shape of the excavation

Term	Synonym	Explanation
In-situ stress	–	– The stress or pressure that exists within the rock mass before any mining has altered the stress field
Instability	–	– Condition resulting from failure of the intact rock material or geological structure in the rock mass
Intersection	–	– The meeting of two roadways
		J
Jack	–	– A manually or hydraulically set mechanical support or lifting appliance
Jack-leg	Air leg	– A percussive drill used for drifting or stopping that is mounted on a telescopic leg, which has an extension of about 2.4 [m] – The leg and machine are hinged so that the drill need not be in the same direction as the leg
Joint	–	– A naturally occurring plane of weakness or break in the rock, along which there has been no visible movement parallel to the plane
		L
Lagging	–	– Steel or timber placed between or behind roadway supports, set so they provide support of the roof to prevent rocks from falling
Loose	–	– Rock that should be removed by scaling to make the workplace safe
		M
Mine roof	–	1. The layer of hardened clay, limestone, sandstone, or other material that lies over the coal-bed 2. Rock or other material above the coal seam
		O
Oil bottle	–	– The bulb type container in the air line to lubricate compressed air driven machinery
Ore	–	– A rock from which economic minerals may be obtained profitably
Out-bye	–	1. The direction along a roadway away from the face 2. Locations between the face and surface
Over-break	–	– The excess rock broken outside the design perimeter of an underground excavation – Over-break increases the amount of rock to be moved and may reduce mining efficiency – It may also increase the amount of barring down and ground support required
Overburden	–	– The material of any nature, consolidated or unconsolidated, that overlies a deposit
Overcast	–	– An airway built over the top, and at an angle to another airway – This is necessary to separate intake and return airways in certain locations
		P
Paddle bolt	Paddle chemical bolt	– A steel rock bolt that has a number of flats, either hot forged or cold pressed, on the chemical end of the bolt – The paddles are used to assist in the mixing of chemical anchors in slightly larger annulus holes
Penny band	–	– Thin dirt band in coal seam (local name)

Term	Synonym	Explanation
Pillar	–	1. A block of coal left to hold up the roof and formed by driving a connected series of headings/bords and cut throughs 2. An area of ore left to support the overlying rock or hanging wall. There are temporary pillars recovered at sometime in the future and permanent pillars left in place for the life of the mine
Plane of weakness	–	– A naturally occurring crack or break in the rock mass along which movement can occur
Plastic	–	– Capability of deformation at constant stress once the yield point is exceeded – The ability of a material to undergo permanent deformation without returning to its original shape or failing
Pointy props	Yeildable props	– A prop with a taper cut on the end, which goes to the floor – The reduced area of prop crushes under pressure without breaking the prop
Portal	–	– Entrance to a tunnel, drift or decline
Prop		– A timber roof support set tightly between the roof and the floor
Pyrite	–	– A hard, heavy, shiny, yellow mineral, FeS_2 or iron disulphide, generally in cubic crystals – Also called iron pyrites, fool's gold, sulphur balls – May be applied also to copper pyrites, tin pyrites, etc. but iron pyrite is the most common sulphide found in coalmines
		R
Ravelling	Unravelling, fretting, spalling	– The gradual failure of the rock mass by rock blocks falling/sliding from the opening perimeter under the action of gravity, blast vibrations or deterioration of rock strength – A gradual failure process that may go unnoticed
Reinforcement	P–	– The use of tensioned rock bolts and cable bolts, placed inside the rock, to apply large stabilising forces to the rock surface or across a joint tending to open – The aim of reinforcement is to develop the inherent strength of the rock and make it self-supporting – Reinforcement is primarily applied internally to the rock mass
Release of load	–	– Excavation of rock during mining removes or releases the load that the rock was carrying – This allows the rock remaining to expand slightly due to the elastic properties of the rock
Resin bolting	Chemical bolting	– A method of permanent roof support, in which steel rods are grouted with resin
Rib	–	– The name given to the coal walls of the roadway – These are the sides of the pillars
Rib support	Arch support, steel ribs, arche	– Multiple steel beams fabricated to form an arch set to provide a heavy-duty support – They are often incorporated with reinforcing in the design of concrete lined tunnels
Rock bolt	Roof bolt	– A tensioned bar, usually steel, that is inserted into a drill hole in the roof or rock to reinforce the surrounding rock – There are many types and shapes of rock bolts and different forms of securing them into the rock surrounds
Rock bolting	Roof bolting, pinning	– The act of consolidating roof strata by means of anchoring and tensioning steel bolts, or dowels, in holes drilled for the purpose
Rock mass	–	– The sum total of the rock as it exists in place, taking into account the intact rock material, groundwater, as well as joints, faults and other natural planes of weakness that can divide the rock into interlocking blocks of varying sizes and shapes

Term	Synonym	Explanation
Rock mass strength	–	– Refers to the overall physical and mechanical properties of a large volume of rock, which is controlled, by the intact rock material properties, groundwater and any joints or other planes of weakness present
Rock mechanics	–	– The scientific study of the mechanical behaviour of rock and rock masses under the influence of force fields
Roof	–	– The immediate exposed strata above a working place or underground roadway
Roof fall	–	– A coal mine cave especially in permanent areas such as entries
Roof jack	–	– A screw or pump-type hydraulic extension post made of steel and used as temporary roof support
Roof plank	–	– Straight, solid wooden material having a minimum cross-section of 51.6 [cm^2] and a minimum thickness of 2.54 [cm] – Used in conjunction with rock bolts for additional bearing surface in supporting the roof
Roof sag	–	– The sinking, bending or curving, especially in the middle, from weight or pressure
Roof truss	–	– Angled bolts anchored over pillars connected by steel bar, sometimes tensioned by a turnbuckle
Rotary drill	–	– A drill which operates by rotation rather than percussion
S		
Scaling	Barring down	– The art and function of making the ground safe using a scaling bar to locate and remove loose rock from the walls, face and backs of the workplace – Loose or potentially unstable rock is prised off the rock surface with a scaling bar
Scaling bar	–	– A solid steel bar with a straight chisel point at one end and a heel and toe chisel point at the other end, used to remove loose potentially unstable rock – Hollow aluminium bars, fitted with steel chisel tips at each end, can provide longer reach in high headings
Second means of egress	–	– The alternative negotiable roadways from the working area of the mine which can be used in an emergency
Secondary roof	–	– The roof strata immediately above the coal bed, requiring support during the excavation of coal
Shaft	–	– An opening, usually vertical, connecting the surface with the underground workings
Shear	–	– A mode of failure where two objects or pieces of rock tend to slide past each other
Shear stress	–	– A stress that tends to cause an object to slide
Shotcrete	Gunite	– Pneumatically applied cement, water, sand and fine aggregate mix that is sprayed at high velocity on the rock surface and is thus compacted dynamically – Tends to inhibit blocks ravelling from the backs, walls and face of an excavation
Sill	–	– An intrusive sheet of igneous rock of approximately uniform thickness and generally extending over a considerable lateral extent – It has been forced between level or gently inclined beds
Slab	–	– A bar of half round bush timber – roof support

Term	Synonym	Explanation
Slabbing	–	– Unstable slabs of rock formed by close spaced foliation or bedding planes in the backs or walls – Can also be caused by high stress levels that produce flat slabs parallel to the walls or backs
Sleeper	Steel sleeper	– Sawn timber, or steel, used to support rails
Slickenside	–	– Geological term – slippery facing in a coal seam, the roof, or in a fault
Slope mine		– Cut at approximately 10 to 17 degree angle down through mountainside
Sloughing	–	– The slow crumbling and falling away of material from roof, rib and face or open pit walls
Spalling	–	– Stress induced failure of the rock mass that results in small, thin, curved, sharp edged pieces of rock ejected or falling from the backs or walls of an excavation – Generally accompanied by rock noise, usually associated with high rock stress
Sprag	–	– A piece of timber placed between a prop and the rib to prevent the rib falling
Square set	–	– A set of steel beams, or timber, used as a frame to provide support in underground mining
Stope	–	– An excavation where ore is extracted
Stopping	–	– A structure (temporary or permanent) built across a roadway to direct the airflow
Strain	–	– The change in length per unit length of a body resulting from an applied force within – The elastic limit strain is proportional to stress
Strength	–	– The largest stress that an object can carry without breaking – Common usage is the stress at failure
Stress	–	– May be thought of as the internal resistance of an object to an applied load – When an external load is applied to an object, a force inside the object resists the external load – The terms stress and pressure refer to the same thing – Stress is calculated by dividing the force acting by the original area over which it acts – Stress has both magnitude and orientation
Stress field	–	– A descriptive term to indicate the pattern of the rock stress (magnitude and orientation) in a particular area
Stress shadow	–	– An area of low stress level due to the flow of stress around a nearby excavation, eg. a large stope – This may result in joints opening up causing rock falls
Support	–	– The use of steel or timber sets, concrete lining, steel liners, etc that are placed in contact with the rock surface to limit rock movement – The rock mass has to move on to the support before large stabilising forces are generated – Support is applied externally to the rock mass
Syncline	–	– A trough-like fold in rocks
		T
Tensile stress	–	– A stress that tends to cause a material to stretch – Can cause joints to open and may release blocks causing rock falls

Term	Synonym	Explanation
Through-steel	–	– A system of dust collection for rock or roof drilling – The drill steel is hollow and a vacuum is applied at the base, pulling the dust through the steel and into a receptacle on the machine
Torque wrench	–	– A wrench that indicates, as on a dial, the amount of torque exerted in tightening a rock bolt
Torque-metre	–	– A device for measuring the actual torque transmitted to the drilling head and/or to the inserted rock bolt
Truss bolt	–	– Roof support (bolt) which is put into the roof at an angle – The anchoring section of bolt is in solid roof above a pillar
Tunnel	Drift, adit, decline, drive	– An opening, horizontal or inclined, at a moderate angle, giving access to a mine
U		
Up-throw (fault)	–	– When the seam is displaced upwards
W		
W" Strap	Skelp	– A formed, ribbed, length of steel used as a cross roof support and held in position by rock bolts – W Straps work by providing a restraint to "bulging" that may occur between roof bolts
Wedge	–	1. A wedge shaped piece of timber to tighten props into place 2. Steel wedge for anchoring slot and wedge rock bolts 3. A block of rock bounded by joints on three or more sides that can fall or slide out under the action of gravity, unless supported
Y		
Yield point	–	– The maximum stress that a material can sustain without permanent deformation or rupture – A limit of proportionality between stress and strain – Also known as elastic limit

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